

What is claimed is:

1. A system for turbo encoding data, comprising:
a first constituent encoder, adapted to encode said data to output first encoded data;
an interleaver, adapted to interleave said data to produce interleaved data;
a second constituent encoder, adapted to encode said interleaved data to output second encoded data; and
a modulator, adapted to modulate said first and second encoded data in accordance with modulation symbols mapped in a multi-circular constellation, to reduce power loss during transmission of said modulated first and second encoded data over a non-linear channel.
2. A system as claimed in claim 1, wherein:
said multi-circular constellation includes at least two circles, each having different radii.
3. A system as claimed in claim 2, wherein:
said multi-circular constellation includes two of said circles.
4. A system as claimed in claim 2, wherein:
said multi-circular constellation includes more than two of said circles.
5. A system as claimed in claim 2, wherein:
a number of said symbols in one of said circles is different from a number of said symbols in any of the other said circles.
6. A system as claimed in claim 2, wherein:
all of said circles are concentric to form said multi-circular constellation.

7. A system as claimed in claim 2, wherein:
a number of said symbols in the outer said circles increase relative to those in
the inner said circles.

8. A system as claimed in claim 1, wherein:
said multi-circular constellation includes at least 16 symbols.

9. A system as claimed in claim 8, wherein:
said multi-circular constellation includes 16 said symbols.

10. A system as claimed in claim 8, wherein:
said multi-circular constellation includes more than 16 said symbols.

11. A system as claimed in claim 1, further comprising:
a deinterleaver, adapted to deinterleave said second encoded data after said
second encoded data has been modulated by said modulator.

12. A system as claimed in claim 1, further comprising:
a puncturer, adapted to puncture said first and second modulated encoded data.

13. A system as claimed in claim 1, wherein:
each of said first and second encoders includes a convolutional encoder.

14. A method for turbo encoding data, comprising:
encoding said data to output first encoded data;
interleaving said data to produce interleaved data;
encoding said interleaved data to output second encoded data; and
modulating said first and second encoded data in accordance with modulation
symbols mapped in a multi-circular constellation, to reduce power loss during

transmission of said modulated first and second encoded data over a non-linear channel.

15. A method as claimed in claim 14, wherein:
said multi-circular constellation includes at least two circles, each having different radii.
16. A method as claimed in claim 15, wherein:
said multi-circular constellation includes two of said circles.
17. A method as claimed in claim 15, wherein:
said multi-circular constellation includes more than two of said circles.
18. A method as claimed in claim 15, wherein:
a number of said symbols in one of said circles is different from a number of said symbols in any of the other said circles.
19. A method as claimed in claim 15, wherein:
all of said circles are concentric to form said multi-circular constellation.
20. A method as claimed in claim 15, wherein:
a number of said symbols in the outer said circles increase relative to those in the inner said circles.
21. A method as claimed in claim 14, wherein:
said multi-circular constellation includes at least 16 symbols.
22. A method as claimed in claim 21, wherein:
said multi-circular constellation includes 16 said symbols.

23. A method as claimed in claim 21, wherein:
said multi-circular constellation includes more than 16 said symbols.

24. A method as claimed in claim 14, further comprising:
deinterleaving said second encoded data after said second encoded data has
been modulated.

25. A method as claimed in claim 14, further comprising:
puncturing said first and second modulated encoded data.

26. A method as claimed in claim 14, wherein:
each of said encoding includes convolutional encoding.

the *Journal of the American Statistical Association* (1937) and the *Journal of the Royal Statistical Society* (1938).